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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/540,107	Applicant(s) LE BRAS ET AL.	
	Examiner ATIBA O. FITZPATRICK	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _31 July 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-25_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-25_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's amendments of independent claims 1, 19, and 24 changed their scopes in that the limitations "on the one hand… and on the other hand" were removed from the respective last stanzas such that an interpretation is required that the determining is concurrently based on the digitized radiological data and generic model.

On page 18 of Applicant's remarks, Applicant disputes that the Charles reference teaches "generic model" by providing a definition of the word "generic" as defined by freedictionary.com to be "relating to or descriptive of an entire group or class; general". However, let us examine how Applicant has explained this "generic model" in the specification of the instant application. In paragraph 0092, Applicant states that "This generic model corresponds, for example, to a specific specimen". Therefore, the generic model can correspond to an individual specimen. In paragraph 0094, Applicant further states that "the generic models used could also be models produced beforehand by medical imaging on the patient P". Therefore, the generic model can be produced solely based on image data pertaining to the patient of interest. Charles also discloses a model that is produced from image data of the patient. The model taught by Charles is generic or general for various reasons. Firstly, the model is generic in its application. In paragraph 0094, Charles states that: "[t]he 3-D modeling is expected to provide useful information for many additional applications besides bone strength. For example, the system can be used to construct the spatial relationship between bones and metal

objects implanted in the patient for repair or as prosthetics". Secondly, the model may be general in terms of what is represents. In paragraph 0140, Charles states; "three-dimensional model of one or <u>more bones</u>" (emphasis added).

In the last three paragraphs of page 18 of Applicant's remarks, Applicant purports to describe the use of a generic model of the claimed invention. However, the discussed limitations are not actually present in the claims. Therefore, Applicant's arguments in this regard are moot.

Applicant argues that the depending claims are allowable since the independent claims are alleged to be allowable, but this assertion is obviated with the office's foregoing arguments.

Claim Objections

Claim 22 is objected to because of the following informalities: Claim 22 includes the phrase "in which wherein", which is poor grammar. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 14 and 19-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The last stanza of claim 19 includes the

phrase “the first digitized radiological data”. However, there is not mention in this claim of second or subsequent digitized radiological data. Therefore, one cannot know the significance of the word “first”. Claim 19 recites the limitation “the first digitized radiological data” in the last stanza. There is insufficient antecedent basis for this limitation in the claim. The dependent claims do not remedy these deficiencies. Claim 14 recites the limitation “the (e1) identifying” and “the (e3) determining”. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 0238045 (Charles) in view of USPGPubN 20030112921 (Lang) and "3D Reconstruction Method From Biplanar Radioraphy Using Non-stereocorresponding Points and Elastic Deformable Meshes", Mitton et al., Medical and Biological Engineering and Computing, 2000, Vol. 38. (Mitton).

Arguments made in rejecting claims 1, 24, and 25 are analogous to arguments for rejecting claim 19. Charles also teaches computer program stored on support **(See arguments made for rejecting claim 19 Charles: paras 75, 86, 95, 159; Fig. 10)**.

Arguments made in rejecting claims 2-5, and 8 are analogous to arguments for rejecting claim 19-21. Note that the citations offered refer to multiple images pertaining to multiple angles of incidence.

As per claim 6, Charles in view of Lang and Mitton teaches Method according to Claim 5, in which the first and second radiological data are obtained respectively in the first incidence and second incidence, by two consecutive scans of said anatomical part **(Charles: paras 17-22: particularly 17; Fig. 1)**.

As per claim 7, Charles in view of Lang and Mitton teaches Method according to Claim 5, in which the first and second radiological data are obtained by simultaneous scanning, in the first incidence and the second incidence, of said anatomical part **(Charles: Fig. 1: note that the fan-beam projection results in a plurality of data with each pertaining to a different angle of incidence of the projected light. This fan-beam projection onto the detector array and image forming of the plurality of data is performed simultaneously)**.

As per claim 9, Charles in view of Lang and Mitton teaches Method according to claim 1, in which (b) determining comprises:

(b1) identifying, on at least the image, predetermined markers corresponding to said osseous body, (b2) determining in a three-dimension reference system, and by virtue of

first means of reconstruction, a geometric position of each marker identified in (b1) the identifying **(Charles: Figs. 9a, 9d; Fig. 6c: 664-666; Fig. 7: 702-706; Fig. 3: 370: "bone positions, cross sections"; para 133)**, and

(b3) determining, by virtue of second means of reconstruction, the three-dimensional shape of an actual model representing said osseous body, by deformation of a predetermined generic model while at the same time keeping markers of this generic model in coincidence, during deformation, with the markers reconstructed by the first means of reconstruction **(Charles: Fig 7: particularly 714-716; paras 143-146: "It is anticipated that a conebeam reconstruction with from three to seven projections is adequate to produce a pseudo 3-D geometry that is mechanically equivalent to a measured hip. FIG. 9D is a sequence of seven images depicting a cone-beam reconstruction used to construct a 3-D model according to steps of the method in FIG. 7". The measured hip can be understood to be the generic model and the computed model can be understood to be the actual model or vice versa. Also, Fig. 8: 810; paras 148-150)**.

Lang and Mitton teaches (b1) identifying, on at least the image, predetermined markers corresponding to said osseous body, (b2) determining in a three-dimension reference system, and by virtue of first means of reconstruction, a geometric position of each marker identified in (b1) the identifying **(Lang: See arguments made for rejecting claim 9; Mitton: abstract: "anatomical landmarks visible in more than one projection"; Fig. 1, 3; page 4, col 1; page 3, col 1, para 4: "landmarks were**

identified by hand”), and

(e3) determining, by virtue of second means of reconstruction, the three-dimensional shape of an actual model representing said osseous body, by deformation of a predetermined generic model while at the same time keeping markers of this generic model in coincidence, during deformation, with the markers reconstructed by the first means of reconstruction **(Lang: See arguments made for rejecting claim 9; Mitton: abstract: “3D reconstruction of additional landmarks that can be identified in only one of the radiographs. The principle of this method is the deformation of an elastic object that respects stereocorresponding and non-stereocorresponding observations available in different projections... The reconstructed geometry obtained is compared with direct measurements using a magnetic digitiser... Comparison results indicate that the obtained reconstruction is close to the actual vertebral geometry. This method can therefore be proposed to obtain the 30 geometry of vertebra”; page 2, col 1, paras 2-3)**.

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to implement the teachings of Mitton into Charles since Charles suggests a system for reconstructing a 3D image/model from multiple 2D radiographic projections using markers in general and Mitton suggests the beneficial use of a system for reconstructing a 3D image/model from multiple 2D radiographic projections using markers wherein stereoscopic and nonstereoscopic markers are used as to be “an improvement on 3D reconstruction using the DLT procedure. It increases the number of

3D reconstructed points by using 2D points identifiable in only one of the radiographs. The principle of this method is, the deformation of an elastic generic object (deformable mesh) that respects stereocorresponding and nonstereocorresponding observations available in different projection" (Mitton: page 2, col 1, para 2) in the analogous art of image processing. Furthermore, one of ordinary skill in the art at the time the invention was made could have combined the elements as claimed by known methods and, in combination, each component functions the same as it does separately. One of ordinary skill in the art at the time the invention was made would have recognized that the results of the combination would be predictable.

As per claim 10, Charles in view of Lang and Mitton teaches Method according to Claim 9, in which the generic model is deformed in such a way that the actual model follows a shape which is as close as possible to an isometry of the generic model **(Charles, Lang, and Mitton: See arguments made for rejecting claim 9)**.

As per claim 11, Charles in view of Mitton teaches Method according to Claim 9, comprising a (g) which consists in determining, in a three-dimension reference system, and by virtue of third means of reconstruction, the geometric position of three-dimensional contours belonging to said osseous body, by bringing markers identified in step (b1) into line with three-dimensional contours of the generic model which are projected onto at least the image **(Charles: See arguments made for rejecting claim 9)**. Charles does not teach by performing a non- homogeneous geometric deformation

of the generic model in order to improve a match between information originating from at least the first image and information representative of the actual model.

Lang and Mitton teaches by performing a non-homogeneous geometric deformation of the generic model in order to improve a match between information originating from at least the first image and information representative of the actual model **(Lang: See arguments made for rejecting claim 9; Mitton: See arguments made for rejecting claim 9: abstract: "Standard 3D reconstruction of bones using stereoradiograph y is limited by the number of anatomical landmarks visible in more than one projection… deformation of elastic object that respects stereocorresponding and non-stereocorresponding observations available in different projections."; page 2, col 1, para 2: "The method presented in this paper is an improvement on 3D reconstruction using the DLT procedure. It increases the number of 3D reconstructed points by using 2D points identifiable in only one of the radiographs. The principle of this method is, the deformation of an elastic generic object (deformable mesh) that respects stereocorresponding and nonstereocorresponding observations available in different projections")**.

As per claim 12, Charles in view of Lang and Mitton teaches Method according to claim 9. Charles does not teach in which:

during the (b1) identifying, some of the identified markers, called non-stereo-corresponding control markers, are visible and identified only on a single image,

and, during the (b2) determining, the geometric position of each non-stereo-corresponding control marker in the three-dimension reference system is estimated from the generic model, by displacing the non-stereo-corresponding control markers of the generic model, each on a straight line joining: the X-ray source to the origin of the image in which a projection of this non-stereo-corresponding control marker is visible and identifiable, and, the projection of this marker onto this image, the non-stereo-corresponding control markers thus being displaced to respective positions which minimize the global deformation of the generic model of the object to be observed.

Lang and Mitton teaches during the (b1) identifying, some of the identified markers, called non-stereo-corresponding control markers, are visible and identified only on a single image **(Lang: See arguments made for rejecting claim 9; Mitton: abstract: "3D reconstruction of additional landmarks that can be identified in only one of the radiographs"; page 2, col 1, para 3: "by using 2D points identifiable in only one of the radiographs")**,

and, during the (b2) determining, the geometric position of each non-stereo-corresponding control marker in the three-dimension reference system is estimated from the generic model, by displacing the non-stereo-corresponding control markers of the generic model, each on a straight line joining: the X-ray source to the origin of the image in which a projection of this non-stereo-corresponding control marker is visible and identifiable **(Lang: See arguments made for rejecting claim 9; Mitton: abstract: "This technique is based on the principle that any non-stereocorresponding point**

belongs to a line joining the X-ray source and the projection of the point in one view"; abstract: "anatomical landmarks visible in more than one projection"; page 2, col 1, para 7: "joining the X-ray source"; page 3, col 1, para 1: steps 1-4), and, on the other hand, the projection of this marker onto this image **(Mitton: page 2: col 1, para 7 – col 2, para 2)**,

the non-stereo-corresponding control markers thus being displaced to respective positions which minimize the global deformation of the generic model of the object to be observed **(Lang: See arguments made for rejecting claim 9; Mitton: page 3, col 1, para 1: step 5; page 3, col 2, paras 2-3)**.

As per claim 13, Charles in view of Lang and Mitton teaches Method according to Claim 12.

Charles does not teach in which, during the (b3) determining, the value of the quadratic sum is minimized:

S = **[Refer to the image file wrapper for amended claim 13 filed 6/20/05]**

where k is a constant coefficient, m is a whole number of imaginary springs joining each marker of the generic model to other markers of this model, k; is a predetermined value of stiffness of the imaginary spring of index i, xi0 is the length of the imaginary spring of index i in the initial generic model, and x; is the length of imaginary spring of index i in the generic model during deformation.

Mitton teaches in which, during the (b3) determining, the value of the quadratic sum is minimized:

S = **[Refer to the image file wrapper for amended claim 13 filed 6/20/05]**

where k is a constant coefficient, m is a whole number of imaginary springs joining each marker of the generic model to other markers of this model, k; is a predetermined value of stiffness of the imaginary spring of index i, xi0 is the length of the imaginary spring of index i in the initial generic model, and x; is the length of imaginary spring of index i in the generic model during deformation **(Mitton: page 2, col 2)**.

As per claim 14, Charles in view of Lang and Mitton teaches Method according to claim 9.

Charles does not teach in which:

during the (e1) identifying, at least some of the markers are stereo-corresponding control markers visible and identified on the first image and another image, and, during the (e3) determining, the geometric position of the stereo-corresponding control markers is directly calculated from measurements of position of the projections of these markers onto the first image and the other image.

Mitton teaches in which:

during the (e1) identifying, at least some of the markers are stereo-corresponding control markers visible and identified on the first image and another image, and, during the (e3) determining, the geometric position of the stereo-corresponding control markers

is directly calculated from measurements of position of the projections of these markers onto the first image and the other image **(Mitton: See arguments made for rejecting claim 9. abstract: "The principle of this method is the deformation of an elastic object that respects <u>stereocorresponding</u> and non-stereocorresponding observations available in different projections"; page 2, col 1, para 2; page 2, para 5: "The stereocorresponding points that are obWed in at least two different images are reconstructed using the DLT algorithm"; page 3, col 1, para 1-2; page 5, col 2, para 6, Fig. 1)**.

As per claim 15, Charles in view of Lang and Mitton teaches Method according to claim 1, comprising (h) performing a radiographic calibration of the three-dimensional environment of said osseous body by defining a three-dimensional reference system in which are expressed the coordinates of each X-ray source and of the detection means for each incidence **(Charles: para 16: "calibrating bone properties"; <u>para 61</u>; Fig. 1; para 47-50; Fig. 3: 310-320; Fig. 4; paras 80-81, 96-113)**.

As per claim 16, Charles in view of Lang and Mitton teaches Method according to claim 1, in which, during the (b) determining, contour lines corresponding to limits of said osseous body and/or to lines of greater grey level density inside these limits are plotted on each image **(Charles: Fig. 9a, 9d. The contours are the edges of the bones)**.

Mitton teaches (e), contour lines corresponding to limits of said osseous body and/or to lines of greater grey level density inside these limits are plotted on each image **(Mitton: Fig. 4)**.

As per claim 17, Charles in view of Lang and Mitton teaches Method according to claim 1, in which the composite index is a parameter chosen from among a combination of a specific parameter of the bone geometry, chosen from among an angle, length, surface and volume of an osseous part **(Charles Fig. 6c: 664 and 670; para 118: "bone orientation… long axis of the bone"; Fig. 9d)**, with at least one of the following parameters **(note that only one of the following alternatives is required)**:

a physical parameter chosen from the bone mineral density and
a mass of an osseous part **(Charles: Fig. 3: 360; Fig. 4; Fig. 6: 640, 668)**,
a mechanical parameter chosen from the section modulus and
moments of inertia of an osseous part **(Charles: Fig. 3: 390; Fig. 6: 670; Fig. 7; Fig. 8: 806; Fig. 9c; para 91; para 118: "moments of inertia")**, and
a chemical parameter chosen from the water composition, fat composition and bone composition of an anatomical part comprising said osseous body **(Charles: Fig. 6b; para 87: "if no bone is available"; para 118: "determine how much of the soft tissue mass is lean and how much is fat"; para 125: "determining soft tissue decomposition… composition of soft tissue")**.

Arguments made in rejecting claim 18 are analogous to arguments for rejecting claim 17.

As per claim 19, Charles teaches Device for radiographic imaging, comprising: calculation means designed to calculate digitized radiological data from signals delivered by means of detection of X-rays and corresponding to pixels of an image of an anatomical part comprising an osseous body and scanned **(Charles: abstract: pages 3-5: "dual-energy x-ray absorptiometry apparatus…first image data having pixels indicating bone mineral density"; para 17; Fig. 1: 160; Fig. 3: 350-398)**, in an incidence **(Charles: abstract: pages 3-5: "first angle")**, with a beam of X-rays having an energy spectrum distributed about at least two energies **(Charles: abstract: pages 3-5: "dual energy")**, these comprising, for each pixel, coordinates of the pixel in the image and absorptiometry values designed to calculate the bone mineral density of the osseous body **(Charles: abstract: pages 3-5: "absorptiometry…first image data having pixels indicating bone mineral density" Note that pixels are known to represent coordinate information. At the very least, a pixel represents a coordinate in image space. An osseous body is known to contain bones)**, in units of a surface area unit **(Charles: para 16 "first conic-surface function"; para 101: "The thicknesses occur between five top surface"; Fig. 2a: "area detector"; para 58: "energy per unit area"; para 87 "mass per unit area"; para 134: "bone area is computed"; Fig. 4b)**, and storage means for storing at least one three-dimensional generic model of said osseous body **(Charles: Fig. 10; Fig. 3: 350-370, <u>390</u>-398; Fig.**

8: 806-810. Note that the data must be stored to be used),

characterized in that the calculation means are also designed to determine the value of a composite index using, based on the first digitized radiological data, and, based on at least one three-dimensional generic model of said osseous body, stored in the storage means **(Charles: abstract: pages 3-5: "for computing principal moments of intertia and strength moduli of individual bone, plus risk of injury and changes in risk of injury to a patient"; Fig. 3: 350-370, 390-398; Fig. 8: 806-810; para 91: "three-dimensional (3-D) model"; para 75, 77, 90-94; Fig. 7)**.

Lang teaches storage means for storing at least one three-dimensional generic model of said osseous body, characterized in that the calculation means are also designed to determine the value of a composite index using, based on the first digitized radiological data, and, based on at least one three-dimensional generic model of said osseous body, stored in the storage means **(Lang: para 212: "general model"; para 275: "A general model of the proximal femur is created by manually outlining the shape in a training set of typical hip radiographs to form a mean shape. The six predefined ROI are then embedded into this model. This mean model is scaled down 80%, isometrically along its centerline. This transformation is applied to the predefined ROI as well. The outline of the rescaled model is then used as the initial template and is positioned within the proximal femur in the input image. The control points of the contour are subsequently expanded outwards away from the nearest centerline point. The energy function to be optimized in this iterative process can**

take into account local features, such as gradient, intensity, deviation from the mean model, and curvature of contour segments. FIG. 14 illustrates the propagation of the initial control points towards the femur edge. When the iteration is completed, a deformation field for the model area is calculated. This deformation field is interpolated for the model ROI inside the boundaries of the femur model. The result is a new set of ROI that is adapted to the input image, but similar to the model ROI with respect to anatomical landmarks (see FIG. 9)"; Fig. 9).

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to implement the teachings of Lang into Charles since Charles suggests a system for bone structure evaluation using a generic model in general and Lang suggests the beneficial use of a system for bone structure evaluation using a deformable generic model as to have "a new set of ROI that is adapted to the input image, but similar to the model ROI" (Lang: para 275) in the analogous art of image processing. Furthermore, one of ordinary skill in the art at the time the invention was made could have combined the elements as claimed by known methods and, in combination, each component functions the same as it does separately. One of ordinary skill in the art at the time the invention was made would have recognized that the results of the combination would be predictable.

Mitton teaches storage means for storing at least one three-dimensional generic model of said osseous body, characterized in that the calculation means are also designed to determine the value of a composite index using, based on the first digitized radiological data, and, based on at least one three-dimensional generic model of said osseous body, stored in the storage means **(Mitton: page 2, col 1, para4 : "generic object"; page 2, col 2: "elastically deforming the generic object"; abstract: "anatomical landmarks visible in more than one projection"; Fig. 1, 3; page 4, col 1; page 3, col 1, para 4: "landmarks were identified by hand"; abstract: "3D reconstruction of additional landmarks that can be identified in only one of the radiographs. The principle of this method is the deformation of an elastic object that respects stereocorresponding and non-stereocorresponding observations available in different projections... The reconstructed geometry obtained is compared with direct measurements using a magnetic digitiser... Comparison results indicate that the obtained reconstruction is close to the actual vertebral geometry. This method can therefore be proposed to obtain the 30 geometry of vertebra"; page 2, col 1, paras 2-3; abstract: "Standard 3D reconstruction of bones using stereoradiograph y is limited by the number of anatomical landmarks visible in more than one projection... deformation of elastic object that respects stereocorresponding and non-stereocorresponding observations available in different projections."; page 2, col 1, para 2: "The method presented in this paper is an improvement on 3D reconstruction using the DLT procedure. It increases the number of 3D reconstructed points by using 2D points identifiable in only one**

of the radiographs. The principle of this method is, the deformation of an elastic generic object (deformable mesh) that respects stereocorresponding and nonstereocorresponding observations available in different projections”).

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to implement the teachings of Mitton into Charles since Charles suggests a system for reconstructing a 3D image/model from multiple 2D radiographic projections using markers in general and Mitton suggests the beneficial use of a system for reconstructing a 3D image/model from multiple 2D radiographic projections using markers wherein stereoscopic and nonstereoscopic markers are used as to be “an improvement on 3D reconstruction using the DLT procedure. It increases the number of 3D reconstructed points by using 2D points identifiable in only one of the radiographs. The principle of this method is, the deformation of an elastic generic object (deformable mesh) that respects stereocorresponding and nonstereocorresponding observations available in different projection” (Mitton: page 2, col 1, para 2) in the analogous art of image processing. Furthermore, one of ordinary skill in the art at the time the invention was made could have combined the elements as claimed by known methods and, in combination, each component functions the same as it does separately. One of ordinary skill in the art at the time the invention was made would have recognized that the results of the combination would be predictable.

As per claim 20, Charles in view of Lang and Mitton teaches Device according to Claim 19, comprising in addition: radiation-generating means designed to generate, in at least the incidence, at least one beam of X-rays having an energy spectrum distributed about at least two energies and to scan at least one anatomical part comprising said osseous body **(Charles: See arguments made for rejecting claim 19. Figs 1-3)**,

means of detection designed to detect the energy of the radiation corresponding to the X-rays scanning, in the incidence, each anatomical part comprising said osseous body and transmitted by each of the scanned parts, and to deliver, from the detection means, signals corresponding to the radiation transmitted **(Charles: See arguments made for rejecting claim 19. See arguments made for rejecting claim 19. Figs 1-3; para 60)**,

means for digitizing and recording the signals delivered by the detection means and corresponding at least to the incidence, in order to constitute the radiological data **(Charles: See arguments made for rejecting claim 19. Figs 1-3)**.

As per claim 21, Charles in view of Lang and Mitton teaches Device according to Claim 20, wherein said incidence is a firs incidence, wherein:

the radiation-generating means are also designed to generate, in a second incidence not parallel to the first incidence, a beam of X-rays having an energy spectrum distributed about at least one energy, and to scan at least one anatomical part comprising said osseous body **(Charles: see arguments made for rejecting claims 19 and 20. abstract: pages 3-5: There are three images and each one is associated with light at different angles of incidence. This is a dual-energy**

apparatus),

the means of detection are also designed to detect the energy of the radiation corresponding to the X-rays scanning, in the second incidence, each anatomical part comprising said osseous body and transmitted by each of the scanned parts, and to deliver signals corresponding to the radiation transmitted **(Charles: See arguments made for rejecting claim 19. abstract; Figs 1-3)**,

the means of digitization and recording are also designed to digitize and record the signals delivered by the detection means and corresponding to the second incidence, in order to constitute second radiological data **(Charles: See arguments made for rejecting claim 19. abstract; Figs 1-3)**.

As per claim 22, Charles in view of Lang and Mitton teaches Device according to Claim 20, in which wherein said incidence is a firs incidence, wherein:

the radiation-generating means consist of a single X-ray radiation source generating alternately two X-ray beams, each corresponding to a different energy spectrum, this radiation source being movable, relative to said osseous body, in a plane comprising the first incidence and also along an axis of translation perpendicular to this plane **(Charles: See arguments made for claims 19 and 20. Fig. 1: Fig. 1a: "multiple-projection, dual-energy x-ray absorptiometry": Fig. 1b: "different projection angle"; paras 47-49, 52-55: "In a dual-energy system, the power supply also drives the x-ray tube at a different voltage V2, which causes a different**

distribution of x-ray energies (frequencies) with a different cutoff energy (at a second cutoff fiequency vc2) and a different peak energy (at a second peak frequency vp2)". The same power supply cannot drive the x-ray tube at different voltages simultaneously; para 83: "the next energy beam is one of the two or more photon energies"; Fig. 3: 328), and in which the detection means consist of a detector comprising a line of detection cells perpendicular to the axis of translation, the radiation source and the detector being aligned on a source-detector axis parallel to the plane comprising the first incidence **(Charles: See arguments made for claims 19 and 20. Fig. 1-2. From view figure 1, it is apparent that the radiation source and the detector are aligned on a source-detector axis parallel to the plane comprising the first incidence and second incidence; para 72)**.

As per claim 23, Charles in view of Lang and Mitton teaches Device according to Claim 19, in which the calculation means are designed to plot contours or points of the surface of said osseous body on an image of form: Im(x, y) = **[Refer to the image file wrapper for amended claim 23 filed 6/20/05]** where the ai are real coefficients, the fi are functions from R to R, the Si(x,y) are the absorptiometry values for each pixel (x,y) of said image obtained with a radiation whose energy distribution corresponds to a spectrum i **(Charles: Fig. 4,6-9; para 111; paras 16-19. This can be understood to mean that the pixel values are points that are rendered (plotted) in the bone-surface containing image according to the equation. This can also be interpreted**

to mean that the bone-surface containing image is created according to the equation, and points pertaining to the bone-surface are plotted. The citations support both interpretations. In considering the equation, not that ai can be assumed to be any value including zero and 1. "i" need not range past one; however the reference refers to multiple individual images pertaining to multiple angles of incidence. "fi" can be arbitrary. Absorptiometry values pertain to x-ray attenuation in tissues. Note that the coordinates (x,y) can be understood to pertain to the pixel locations in the detector array).

Mitton teaches the calculation means are designed to plot contours or points of the surface of said osseous body on an image of form: Im(x, y) = **[Refer to the image file wrapper for amended claim 23 filed 6/20/05]** where the ai are real coefficients, the fi are functions from R to R, the Si(x,y) are the absorptiometry values for each pixel (x,y) of said image obtained with a radiation whose energy distribution corresponds to a spectrum i **(Mitton: See arguments made for rejecting claim 9, 11, and 16. abstract: "point-to-surface"; Figs. 1, 3, 4)**.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Atiba Fitzpatrick whose telephone number is (571) 270-5255. The examiner can normally be reached on M-F 10:00am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571)272-7413. The fax phone number for Examiner Atiba Fitzpatrick is 571-270-6255.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Atiba Fitzpatrick

/A. O. F./

Examiner, Art Unit 2624

/Samir A. Ahmed/

Supervisory Patent Examiner, Art Unit 2624